

NASA TECH BRIEF

Lewis Research Center



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High Voltage Lightning Grounding Device

The problem:

To prevent lightning-induced high voltage transients from reaching the inputs or outputs of solid state instruments and control systems. These transients, if unchecked, can destroy discrete solid state devices

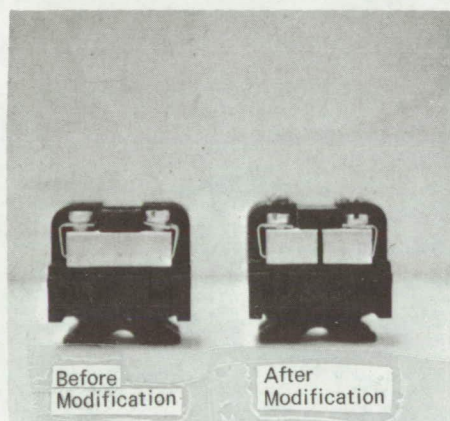


Figure 1. Wire-Terminal Block

within the systems. When a large number of systems are connected within a completed facility by multi-conductor cables, many system failures can result from a single lightning strike.

The solution:

A simple modification of the terminal blocks, and the insertion of a transient grounding device in the wire termination cabinets commonly used in large facilities.

How it's done:

Figure 1 shows a typical wire terminal block element before and after modification. The modified block has a saw cut through the metal section that electrically joins the two wire terminals. This circuit break allows a transient grounding element to

be installed in series with the wire. The grounding device has two input wires, two output wires, and a ground (earth) wire. The device is connected in series with the two circuit wires and passes most of the energy from transient voltages to earth.

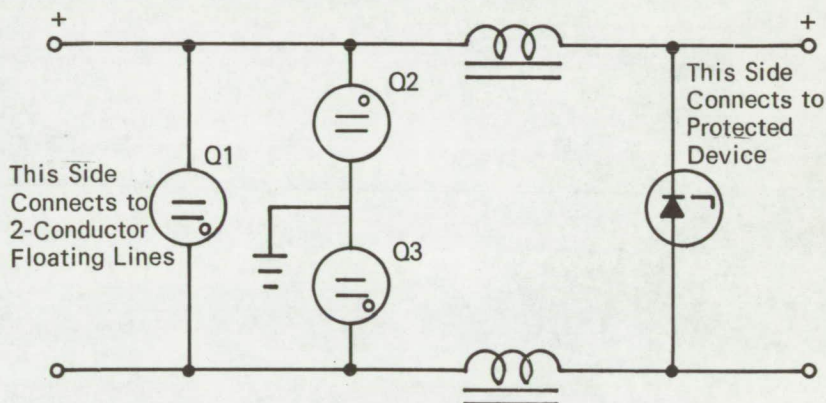


Figure 2. Circuit Schematic

The remaining transient energy is absorbed by the grounding device.

Figure 2 is a schematic of the components used in the grounding device. The first stage, consisting of three gas-filled spark gaps, Q1, Q2 and Q3, passes the major portion of the transient to earth via the ground wire. The second stage, consisting of two ferrite core chokes and a zener diode, removes the remaining transient energy between the output wires.

This transient grounding device has been successfully tested at 10KV and 10 joule strike levels; the highest energy level that can be present in this type of wire terminal block, before the transient, arcs over the block and finds its own path to earth.

Figure 3 shows the interior of a wire terminal

(continued overleaf)

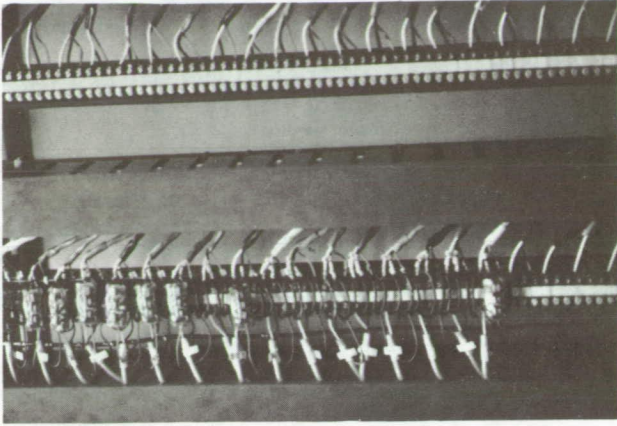


Figure 3. Interior of Wire-Terminal Cabinet cabinet with a number of transient grounding devices installed.

Notes:

1. This installation minimizes wiring confusion and achieves 100% transient protection.

2. No additional documentation is available. Specific questions, however, may be directed to:
Technology Utilization Officer
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Cleveland, Ohio 44135
Reference: B71-10136

Patent status:

No patent action is contemplated by NASA.

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